

Notwithstanding, however, this apparently convincing evidence, I am indisposed to believe it possible that an animal so completely shut up in a thick coriaceous unmuscular sac, can have any power of external movement, nor is it likely that such a power would be possessed by an animal whose whole life (except in infancy) has to be passed firmly rooted to the bottom of the sea. I hope that some one having the leisure and opportunity, will endeavour to solve this problem.

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On some AUSTRALIAN LITTORINIDÆ.

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Linn. Soc. N.S.W., &c.

We have in Australia and Tasmania certain coast shells which are variously distributed in several genera by different authors. They all resemble each other in this, that they are found for the most part on rocks which are seldom covered by the tide. They are not nacreous. They have a horny operculum, with a marginal nucleus and few whorls, and the animal has a small round foot which has never tentacular filaments like the *Turbo*, *Trochus*, or *Phasianella*. They are generally widely distributed, subject to very much variation, according to the locality where they are found. This has led to the same shell being regarded in different places as a different species, and the varieties also have been regarded as different species. In order better to understand the present state of our knowledge of these marine mollusca, it may be as well to state the history of the genus, or rather its classification. To Linnæus all these shells were *Turbos*, and those which were known to Schrötter, Chemnitz, Gmelin, Favanne, Born, Humphrey, and Lamarck, came under the same generic appellation. In 1821 M. Baron Ferussac, in his large and expensive work on the fresh water shells of France (so large and so expensive that it was never finished), divided the genus *Paludina* into five sub-genera. He gave the fifth the name of *Littorina* (written also with one t, or two r's by various writers), and included in that the common perry-winkle *Turbo littoreus* of

Linnæus (*Lit. vulgaris* of Sowerby's Genera of shells). This division of M. de Ferussac was not well understood, nor was it generally adopted. M. de Blainville (in his *Hist. Nat. de Vers testacees*, Paris, 1822, vol. I, p. 347), made another distribution of the species indicated by his predecessor which he regarded as a section of his large genus *Turbo*. Latreille subsequently in his work on the animal kingdom (*Familles du Regne Animal*, Paris, 8vo, 1825), only cites this genus and the relations given by its author, but ignores it in his classification. Although G. Cuvier was very slow in adopting new genera, nevertheless he adopted that of *Littorina* in the second edition of his Animal Kingdom (*Regne Animal par G. Baron Cuvier*, 10 vols., Paris, 1828). But in doing this he hardly can be said to have understood the relations of the animals, for he placed the genus following the fresh-water genus *Paludina* and next to *Monodonta*. I am quoting Deshayes on this matter, who adds (*Hist. Nat. des Animaux s. vertebres*, 2 edit. par Deshayes and M. Edwards, vol. IX, p. 200, note), "Unfortunately when Cuvier published the second edition of this work science was not in possession of facts sufficiently numerous or well enough established on the general relations of Linnæus' large genera of *Turbo* and *Trochus*, to decide on all the classification of those divisions which had been rightly or wrongly made. It is equally true that Lamarck allowing himself to be guided by his extensive knowledge of the characters of shells was much more happy in the classification of these genera than the most part of other zoologists or than G. Cuvier himself." M. Deshayes then goes on to indicate the changes that were necessary in the classification of Lamarck, arising from the observations which he (M. Deshayes) had made upon molluscous animals. He then adds (page 201, note) "In this matter for the genus with which we are now occupied, we have observed that the animal has characters which easily distinguish it from all known species, and which, while it removes them further from either the *Turbo* or the *Trochus* genus, places them closer to *Scalaridæ*. Thus the animal of *Littorina* crawls upon a small foot with thin edges, oval or sub-circular, and almost entirely

hidden by the shell. When the animal moves this foot bears on the upper part of the posterior side an operculum which is always horny, blackish, pauci-spiral and with a lateral nucleus. This operculum forms from two and a half to three whorls; it is semi-circular, and has a straight internal edge like the same organ in the genus *Natica*. The foot is very slightly projecting in front, where it is rounded. The head is rather solid, prolonged into a conical muzzle and terminated by a longitudinal slit wherein is placed the mouth; the head bears two long pointed conical tentacles behind, broad at the base and having at the external side of this base a rather salient, blunt, ocular tubercle. The shells of the genus *Littorina* are easily distinguished from either *Turbo* or *Trochus* because they are never nacreous, and besides the form of the aperture, the flattened and almost trenchant columella, they have peculiar characters of their own. The only difficulty there would be is in separating them from some species of the genus *Phasianella*, if one omits to observe at first that in the latter genus the shells are always very highly polished, and that the operculum is calcareous. Those *Littorinæ* which approach nearest to *Phasianella* have the columella almost straight and trenchant at its edge, which is never seen in the latter genus. Finally the animals are different; the *Phasianellæ* in the ornaments of the head and the tentacles of the foot do not differ from the animal of *Trochus*, while the *Littorinæ*, as we have explained, have characters peculiar to themselves, and which approaches the animal of *Scalaria*. Between the opercula of the genus *Littorina* and *Scalaria* there is a good deal of analogy. The animal of *Scalaria* has the head probosciform, the tentacles are more obtuse, shorter in proportion, and the ocular tubercles are a trifle more elevated."

Having premised these particulars, M. Deshayes defines his genus thus:— Gen. *Littorina*, Ferussac. General characters: Animal spiral, moving on a foot thin oval or subcircular; head probosciform, mouth terminal, anterior; two conical tentacles, pointed, broad at the base; eyes large, hardly projecting from the external base of the tentacles; operculum horny, pauci-spiral

with lateral and submarginal nucleus. Shell turbinate, not nacreous, thick, solid, oval, or globular; aperture entire, slightly oblique to the longitudinal axis, angular at the summit; columella large, curved or almost straight, without inner lip, and, as it were, denuded, and almost trenchant at its internal edge.

He adds that the *Littorinæ*, as their name indicates, live almost always on the rocks which fringe the shore. They are almost always out of water, but they are placed so as to receive the surf which breaks over the rocks. They seem capable of resisting in their exposed position the burning heat of the sun, the torrents of fresh water from rivers, or the fury of the waves which break upon the rocks. I may add from my own observation that they are estuary shells, and flourish in brackish or almost fresh water. M. Deshayes remarks that two species of Lamarck's *Monodonta*, *M. pagodus* (Indian Ocean), and *M. papillosa* (Timor), should both be removed to *Littorina*; also a few of the species of Lamarck's *Phasianella*. With regard to the *M. pagodus*, which was brought to Europe from Capt. Beechey's voyage, Mr. E. Gray made it the type of a new genus, *Pagodus*. The animal, however, as well as the operculum, are those of a true *Littorina*. M. Deshayes also removed into this genus three fossils of the Paris basin which he had formerly described as *Phasianella*, viz., *P. tricostata*, *multisulcata*, and *melanoides*. He was of opinion also that some of the secondary fossils regarded as *Turbo* and *Trochus* should be considered as *Littorina*, notably *T. ornatus* and *carinatus* of Sowerby's *Mineral Conchology*, p. 240.

To these particulars of Deshayes may be added the following facts: The odontophore or lingual ribbon is long and narrow in the case of the Australian species, and I believe I have observed that it is a tube. The greater part is rolled up in a spiral coil at the back of the mouth. It has three simple teeth at each side of the central tooth, which is small. The lateral ones are long, curved, and the two outer ones being tricuspid and the four inner ones bicuspid. The teeth, as well as the

membrane on which they are placed, are colorless, transparent, and glassy. No other molluscan animal, as far as I am aware, has the odontophore coiled up at the back of the mouth.

The shells of the *Littorinæ* are for the most part like the typical species, the common perry-winkle of Europe; that is to say they are elongately turbinate with rounded whorls almost destitute of ornament. But there are some with tubercles and granules upon the spire, and with flattened whorls and angular base. These have been erected into other genera by different authors, as I shall show presently, but at present I am regarding as one genus all those shells which would come under the definitions of Deshayes with regard to the shells and the animals.

There is one peculiarity in some members of the genus to which, as far as I am aware, attention has not been drawn by any naturalist, and it is so very common and so peculiar that it must have some relation to the animal economy. I refer to a spiral white or yellow line which lines the interior of the shell, and arises from the anterior aperture, or at the lower part of the labrum or outer lip. I find this peculiarity on the following members of the genus:—*L. grandis* (Sea of Ochotsk, Reeve), Middenof; *L. Africana*, Philippi, Algoa Bay; *L. ziczac*, Chemnitz, Monte Christo, West Columbia, and South Australia (Kangaroo Island?); *L. cincta*, Quoy & Gaimard; *L. luctuosa*, Reeve, New Zealand; *L. neritoides*, Mediterranean; *L. granularis*, Gray, Hab. ?; *L. striata*, King, Canary Islands, ita Reeve; *L. Novæ Zelandiæ*, Reeve;\* *L. Knysnæensis*, Krauss, Knysna River, Cape; *L. grano-costata*, Reeve, Brisbane; *L. Feejeensis*, Reeve, Feejee; *L. araucana*, D'Orbigny, South America; *L. mauritiana*, Lamk, described as *Phasianella* (= *L. lævis*, Reeve; *L. diemanensis*, Quoy & Gaimard, Chatham Islands; *L. unifasciata*, Gray, Tasmania and S. Australia); *L. melanostoma* (*Risella melanostoma*, Gmelin, *nana* Lamk.; *vittata* and *lutea aurata*, *plana*, *striolata*).

I shall notice presently what I consider will throw some light upon this curious feature. I now pass on to the manner in which

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\* The name and the habitat are Reeve's, but no such shell is known in New Zealand. See *Journal de Conchyliologie*, 1873, p. 26.

*Littorina* has been subdivided by different authors. There are about 200 species at present known. But many of these will need reduction. The following very complete and excellent notice of the family is from Woodward's Manual of the Mollusca (Tate's Edition).

Family LITTORINDÆ.

Shell turbinated or depressed, never pearly, aperture rounded, peristome entire; operculum horny, pauci-spiral; animal with a muzzle-shaped head and eyes sessile at the outer base of the tentacles; tongue long and armed with a medium series of broad hooked teeth, and three oblong hooked uncini; branchial plume single; foot with a linear duplication in front and a groove along the sole; mantle with a rudimentary siphonal canal; operculum lobe appendaged. The species inhabit the sea or brackish water and are mostly littoral feeding on algæ.

LITTORINA, *Ferussac.*

Shell turbinated, thick, pointed, few whorled; aperture rounded, outer lip acute, columella rather flattened, imperforate; operculum pauci-spiral; lingual teeth and trilobed uncini hooked and dentated; 131 species. He adds, "the perry-winkles are found on the seashore in all parts of the world; in the Baltic they live within the influence of fresh water and frequently become distorted; similar monstrosities are found in the Norwich Crag. The common species (*L. littorea*), is oviparous; it inhabits the lowest zones of seaweed between tide marks. An allied species (*L. rudis*), frequents a higher region where it is scarcely reached by the tide; it is viviparous and the young have a hard shell before their birth, in consequence of which the species is not eaten. The tongue of the winkle is two inches long; its foot is divided by a longitudinal line, and in walking the sides advance alternately. The perry-winkle and the trochus are the food of the thrush in the Hebrides during the winter. The lingual canal passes from the back of the mouth under the œsophagus for a short distance, then turns up the right side and terminates in a coil like spare rope resting on a plaited portion of the gullet. It is  $2\frac{1}{2}$  inches long and contains about 600 rows of teeth, the part

in use arming the tongue comprises about 24 rows." Mr. Woodward subdivides the family into 9 genera, viz.:— *Littorina*, *Solarium*, *Phorus*, *Lacuna*, *Litiopa*, *Rissoa*, *Skenea*, *Truncatella* and *Lithoglyphus*. This is not a natural arrangement for many reasons which cannot be entered into here. He arranges the following as subgenera under *Littorina*:—

1.—TECTARIA, *Cuvier*, 1827.\*

Shell muricated or granulated, sometimes with an umbilical fissure; operculum with a broad membranous border.

2.—MODULUS, *Gray*, 1840.

Shell trochiform or naticoid; porcellanous; columella perforated, inner lip worn or toothed; operculum horny or few whorled.

3.—FOSSARUS, *Philippi*, 1841.

Shell perforated, inner lip thin, operculum not spiral.

4.—RISELLA, *Gray*, 1840.

Shell trochiform with a flat or convex base; whorls keeled; aperture rhombic, dark or variegated; operculum pauci-spiral.

5.—CONRADIA, *Adams*, and COUTHUYIA, *Adams*.

The two latter from small species in the Japanese seas which it is not necessary to refer to now.

This arrangement is nearly that of Adams Brothers, in their genera of Mollusca, only that the subgenera are suppressed and the genera are placed as subgenera with Swainson's *Echinella* and Adams' *Isapis* excluded. Chenu, in his "Manual," follows the arrangement of Adams, but appears from the figures given to confound one genus with another, supposing him to accept the divisions given in the "Genera of Shells."

I do not pretend to pronounce an opinion upon some of these genera. I confine my attention in the first instance to those which have reference to species existing on the Australian coast. And first with reference to the genus *Risella*. The history of the genus has already been given by me in vol. I, p. 242, of the

\* There is a dispute about the priority of this name. Valenciennes is quoted by Adams, but his name was *Tectarius*, and Montfort's *Tectus*.

“Proceedings” of this Society. It was erected originally by Philippi for *Littorinæ* with acute whorls, and those peculiarities which have already been referred to.

It was noticed by M. Crosse, in the *Jour. de Conchyl.* for 1865, that this diagnosis would hardly warrant a separation from *Littorina*, but he called attention to another feature that had escaped notice, that is to a basal thickening in a kind of thread about the middle of the aperture. He thought also that there were about nine species. In my paper I attempted to show that there is only one species, and since that time have made a careful comparison of an immense number of individuals from various parts of the coast, and having further observed that all the presumed species breed freely with one another, I make no doubt whatever that this genus, if it is to be preserved, can only be said to be represented by one species.\* Now as to the basal funicular thickening we find that it does not hold good for all the individuals. It is present and absent on different specimens, but more frequently present on old shells. But it has not been remarked that always by the side of it there is a white or yellow spiral line on the outer and anterior angle of the aperture. This white spiral line or groove, for it is both, corresponds with the line I have called attention to in the turbinate *Littorinæ*, and I find that it is a groove along which the organs of reproduction are always exerted, whether they be male or female. I have before shown that this office is variously assumed by different shells. It is not easy to explain why this portion of the shell is differently colored, unless it is in keeping with what is noticed in the coloring of certain flowers, butterflies, &c. The whole of the *Littorinæ* have the aperture of dark color, though highly enamelled, and this whitish line is a conspicuous diversity on the appearance, though it would be a very narrow view of the operations of nature to say that its only purpose was to attract. Round the mouth of most *Risellæ*, and close to this spiral line,

\* In the *Annals of Nat. Hist.* for 1852, vol. II, p. 76, Mr. W. Thompson writes that he had observed several examples of small *Littorina rudis* in coitu with *L. littoralis*, and in every instance the male was *L. rudis*. He suggested that perhaps a hybrid resulted, and this was *L. palliata*, but that form did not frequent that part of the coast. The question has not, as far as I know, been followed. A few very simple observations in a small aquarium might lead to important discoveries in such matters.

there are generally a few diagonal yellow lines which make the spot still more conspicuous, especially as the enamel of the rest of the shell is such a thick glossy lining of intense brown, almost like the varnish known as Brunswick black.

The shape of the species and varieties is very uncertain. Sometimes the shell is almost turbinate, and the whorls rounded; in others it is depressed, the whorls ovately angular, smooth, and flat; others again are more depressed, and the whorls almost keeled with tubercular undulations on the edge, which become almost spinous. At times also the spire is ornamented with coarse nodular protruberances. Now, seeing all these variations we are bound to enquire on what is the generic distinction to rest. Not on the shape or ornamentation of the spire, nor on the depressed or angular sharpness of the whorls. Not on the funicular basal thickening, for that is uncertain too. In any case it would be a genus with one species, but a species which in no respect can be divided generically, from typical *Littorinæ*. The animal is the same; the operculum is horny, pauci-spiral, with a marginal nucleus. The odontophore is the same, and curled in a coil at the back of the head; there are no tentacular appendages. The shell is not nacreous, and the habits of the animal are in all respects those of *Littorina*. It lives almost always out of the water, on rocks exposed to the spray. It is found in brackish water, and can bear the extremes of heat and cold.

Messrs. Adams reminds us in the *Annals of Nat. Hist.* that no harm is done to science by the addition of a new genus, and this is quite true as long as it is founded on well defined and permanent features. But if a genus is erected on characters that are slight and uncertain, and if, moreover, they vary and pass insensibly into others, then it is an injury to science and to the student, who will be bewildered in trying to recognise them; an injury also to any sound system of classification. For these reasons, therefore, I think most scientific men will agree with me that the genus *Risella* ought to be suppressed. It has no permanent characters which can be relied upon to separate it

from *Littorina*. It is simply one of our Australian *Littorinæ*, very determinate and characteristic, though within certain limits very variable. It seems that it has a very wide range, and though specimens from extreme portions of the continent would with difficulty be recognized as the same, yet they are all one species flourishing under different conditions. In thus suppressing the genus *Risella* we are really simplifying the science. I am aware that the principle of suppressing genera which graduate insensibly into one another must not be pressed too far. Thus it would be difficult to draw a distinct line between such apparently well established genera as *Turbo* and *Trochus*. M. Deshayes acknowledged this when he tried to distinguish them by the calcareous or horny operculum, or by their being nacreous or non-nacreous. But all these features are interchanged. A better distinction might be found to rest upon the odontophore or lingual ribbon, but even this is insufficient. But difficulties like these are not in question in the case of a genus with only one species, where the characters on which it is founded appear and disappear in different individuals. *Littorina melanostoma* is, however, a very good and interesting species, and may be taken as one of those forms which give a character to the Australian fauna. It is said to extend to New Zealand, at Auckland, though Capt. Hutton says the locality is doubtful. This species has been re-described in the cruise of the *Novara* as *R. Kielmanseggi*. The following will be the synonymy of the species:—*Trochus in fauce nigerrimus*, *Chemnitz, Conch. Cabinet, t. 5, p. 20, pl. 161, f. 1,526, a.b.* (I cite this and the three following on the authority of Deshayes, in *Lam.* 2nd edit., though far from sure that they refer to the species. †) *Trochus, Schrot, Einl. l. 1, p. 682, n. 12.* *Trochus melanostomus, Gmelin, p. 3,581, No. 90.* *Dillwyn Catalogue, b. l. 2, p. 797, No. 89.* *Deshayes Lamark, Vol. 9, p. 157, No. 78.* *Trochus nanus, ibid., p. 150, No. 67.* *Littorina luteola, Quoy., Voy. de l'Astro. tom. 2, p. 477, pl. 33, f. 47.* *Risella aurata, Quoy.; Risella nana, Quoy.; R.*

\* ? *Risella varia*, Hutton, is given by him as *Adeorbis* in *Jour. de Conch.*, 1878, p. 27, Vol. —. Marten considers it a *Risella*.

† It may be that the origin of the name is from Reeve, *Proc. Zool. Soc.*, 1842, p. 185, as *Trochus*.

*plana*, Quoy. ; *R. lutea*, Quoy. ; *R. Bruni*, Crosse ; *R. lutea*, Philippi, Adams ; *R. vittata*, Philippi ; *R. imbricata*, Gray, Phil., Adams ; *Bembicium nanum*, Philippi ; *B. pictum*, ditto ; *Littorina Australis*, Gray ; *Trochus cicatricosus*, Jonas.

In addition to the above named *Littorina* we have the following cited by various authors as occurring in Australia and Tasmania : *L. mauritiana*, Reeve ; *L. unifasciata*, Gray, Appendix I. 2 vol. of King's Voy. in Australia, p. 483 ; *L. paludinella*, Reeve, Icon. pl. 16, fig. 84 ; *L. Hisseyana*, mihi, Proc. Roy. Soc., Tas., 1875 ; *L. Philippi*, Carpenter, Cat. Magellan Shells, p. 349 ; *L. ziczac*, Chemnitz, t. 5, p. 69, pl. 166, f. 1,600 ; *L. diemanensis*, Quoy. and Gaimard, Voy. de l'Astrol., t. 2, p. 479, pl. 33, f. 8-11 ; *L. pyramidalis*, Quoy. and Gaim., loc. cit. 6, p. 482, pl. 3, f. 12-15 ; *L. undulata*, Gray, loc. cit. ; *L. Australis*, Gray in King, loc. cit.

Some of these shells call for no remark, as they are either doubtful *Littorinæ*, or too little is known about them. *Littorina mauritiana* is, however, one about which there is much to be said. It is a rather elongated turbinated shell, with rounded whorls, the last nearly as long as all the others combined. It is generally of a bluish color, but ranges from pale blue to the faintest bluish white. It is also sometimes spirally banded with faint blue or white lines, or it is longitudinally striated with zig-zag lines of dull green, or reddish lines. At the base of the last whorl there is a very obtuse angle, scarcely perceptible in some shells—very visible in others. Some of the shells are globose, with a very short and acute spire, while the last whorl is immensely disproportioned to the rest. This variety has often the zig-zag dull green lines. The shell varies in size from 5 mil. to 25 in height. The small sizes are young, and of a smalt blue. All these varieties may be obtained from the same patch of rock. It is common everywhere on rocks above high water mark. I have found no difference in its characteristics in Guichen Bay (S. A.), Port Jackson, and the extreme south of Tasmania. Perhaps the South Tasmanian specimens are a little smaller.

I cannot see any specific difference between this shell and *L. Africana* Philippi, and considering that our common shell is identified with the one that occurs at the Mauritius, it is easy to

believe that they are one and the same. Indeed, it is very easy to bridge over any interval when we find such a deep and open sea as that which intervenes between Australia and the Mauritius bridged over by the same species. I believe it to be also identical with *Littorina diemanensis*, Quoy (*Voy. de l'Ast. t. 2, p. 479, pl. 33, f. 8, 11*). Of this species M. Deshayes says, after quoting the habitat of Quoy, which is simply Van Dieman, "The *Littorina* of Dieman is absolutely the bluish *Turbo* of Lamarck," which is a *Littorina*, or as now known *L. cærulescens*. It is found, he adds, in the Mediterranean, and on the English Channel. The only slight difference that M. Deshayes could observe was the presence of certain striæ which the European specimens have not, but I can answer that the Australian species are as often without them. "The individuals are in general larger (he is referring to the Australian shells.) Shell short, slightly swollen at the base, the spire is pointed. The color is sky blue, with an irregular band, rather darker in the last whorl. The aperture is rounded, a little angular, and of a sombre violet within. Its colors are much more brilliant under water than when exposed to the air. It is 11 millim. long, by 6 wide. So far with regard to the Tasmanian species. It is also said to occur in N. Zealand. Captain Hutton has sent me the shells which receive this name (*L. diemanensis*). They came from Dunedin (nearly 46° S. lat.), a very cold station for a shell whose finest and largest examples are found at Port Jackson, or even as far north as lat. 30 S. Consequently, as we might expect, the Dunedin specimens are sordid and dwarfed. The bands of color are far more definite, and the blue, or rather neutral tint predominates over the white, while at Port Jackson the white predominates. The mouth is much darker in the Dunedin shells, and the angle less marked at the base of the last whorl. This is the rule, but intermediate examples can be found at both places. The Port Jackson shells have the last whorl larger than the spire, which is short and tumid. The spire is longer and not tumid at Dunedin, but with rounded whorls. It seems to me that the Dunedin shells may be taken as an intermediate stage to *Littorina cincta*, Quoy, which is the common form on the Dunedin coast, and at the Bluff, N.Z.,

and is synonymous with *L. luctuosa*, Reeve. The most important difference between *L. diemanensis* and *L. cincta* is in the operculum. This organ in the former animal is paucispiral with the nucleus marginal. The whorls also are not only few but oblong. The striæ are fine, and the appearance delicate. In *L. cincta* the operculum is many whorled, but not so many as in *Trochocochlea Australis*. They are circular, rugged, irregular and coarse, and the nucleus is nearly central. In this respect *L. diemanensis* resembles it. In fact, *L. cincta* is only a large *L. diemanensis* dark and sombre in color, rugged and sordid in appearance. The operculum no doubt partakes of the rugged character of the shell. I do not say they are the same species, but I think it would not be difficult to find a series passing insensibly from one species to the other, and I strongly incline to the opinion that *L. cincta* is *L. diemanensis* in a very much colder climate, on an exposed and rocky coast.

But is *L. diemanensis* the proper name for our Australian specimen? In a note on the *Turbo cœrulescens* of Lamarck, Mr. Deshayes says (Lamarck, 2 edit., Vol. 9, p. 217)—“This shell belongs to the genus *Littorina*. It is a species very common on the shores of the Mediterranean. It clings to rocks beaten by the sea, but above its level when calm. Naturalists must find it difficult to determine which is the *Nerita littoralis* of Linné. Those who consult the quoted reference in Lister’s History of the Animals of England, p. 164, cannot fail to recognize the *Turbo cœrulescens* of Lamarck, but those who only consult the figures named in the synonymy of Linné will see that *Nerita littoralis* is the same species as *Turbo neritoides*. But the confusion increases when we read that it is very common and very variable in color on the rocks of the seas of Europe, and that a smaller variety frequents the fresh waters. It is evident that under the name of *Nerita littoralis*, Linné confused three species at the least; *Turbo carulescens* and *T. neritoides* doing double duty and probably *Neritina fluviatilis*. Gmelin simplifies Linné inasmuch as he suppresses the reference to Lister, p. 154, and reduces the synonymy to the figures which represent *Turbo neritoides*. Consequently Gmelin’s *N. littoralis* is a second employment of *Turbo*

*neritoides*. Dillwyn gives to the *Turbo neritoides* quite a different signification from even Linné. He only admits one of the references which is only Gualtieri, fig. F, plate 45. This figure would agree well enough with the *Turbo cœrulescens* of Lamarck, but cannot in any way be referred to the Linnean species."

I have deemed it necessary to refer at length to this question of synonymy in case any of the older works on the citation of Linné should be consulted. Our *L. diemanensis* should on M. Deshayes' authority be considered the same as *L. cœrulescens*. This also is the same as *L. mauritiana*, *unifasciata*, *Africana*, and a host of others. If we believe that only one species ranges between the Cape of Good Hope and Australia then the synonymy will be something enormous.

But does it not seem strange that a shell should fringe our coasts on the Southern Hemisphere and be found quite as common on the north coasts of the Mediterranean, &c., while no sign of its existence can be traced in the intermediate regions. It does seem somewhat unusual and singular, but we have similar facts in Botany. Every one knows for instance the showy purple Loosestrife (*Lythris salicaria*), which is such a conspicuous object in marshy places in Europe. With its companion *Lythris hyssopifolium* it is widely distributed in Europe. Well, when R. Brown landed in Tasmania and began to explore where European feet had surely never trodden before, one of the first things he noticed in the marshy places was the purple Loosestrife of Europe. It was not long before he had found *L. hyssopifolium*, growing with its companion just under its well-known conditions. Such instances might be multiplied, and probably they hold good in the insect world, and in the higher order of animals. It seems as if each country or each province has its particular fauna which is peculiar in its resemblances as well as its differences, and besides all this has a certain amount of features which are the same for every portion of the earth's surface under similar conditions. And moreover it seems to me that the true clue to this fact is one which neither the evolution theory or the "station or dispersion" theory will completely explain. Our Newton of natural science is yet to come, the zoologist of the future, who

shall discern the law which pervades all nature and reads it so that the anomaly of to-day should be the confirmatory fact of to-morrow.

In keeping with the above fact we have *Littorina ziczac*, which is a shell very much like our *L. cœrulescens* except that it is streaked with undulating red lines. This is a common form in some of the West Indian Islands, at Monte Christo in West Columbia, and is not uncommon on Kangaroo Island in South Australia, and on other parts of the South Australian coast. My own idea is that it is only a variety of *L. cœrulescens*. I do not assert this positively, but I am inclined to think it. The extraordinary variations to which shells are subject in the matter of color makes one prepared for anything. *Trochocochlea australis* is variegated light green and white, dark olive and yellow, reddish brown and yellow, and finally a uniform dull black or greenish black. *T. constricta* is dull white, dull yellow pale flesh color, or streaked a bright green and white, red and yellowish green, neutral tint and white, or black and white. Then the shape of these variegations are just as diverse. The streaks are sometimes three or four, or they are narrow pointed and numerous, or they are very fine zigzag lines, the angles of the zigzags being very acute and the lines long or few and obtuse, &c., &c. In fact, within given limits, there is no form or pattern of color that might not find representatives in these most variable shells. If color then be the only difference, I think we should claim *L. ziczac* too as a synonym for our *Littorina*, but the animals I have not examined and have only imperfectly examined the shell.

Next to *L. cœrulescens*, for such I shall always now designate our common coast perrywinkle, we have a species called *Littorina pyramidalis*, by Quoy. (*Voy. de l'Astrolabe*, vol. 2, p. 482, pl. 33, fig. 12-15). He states that "it was found in Jervis Bay, and is remarkable for its pyramidal form, with the last whorl much swollen, and seems a base from which the spire rises abruptly." It is rough girdled with a string of tubercles on the spire, and which is doubled on the summit of the last whorl. These tubercles are prominent, round and blunt. It shows some

irregular longitudinal folds on the outer edge of the lip. The aperture is small, round, but somewhat irregular; is highly enamelled, a deep purple brown color, and there are two spiral yellowish lines running up the throat, one at the base or anterior as already described in other *Littorinæ*, and the other between the suture and the posterior line of tubercles, but just at the edge of the latter. The columella is very much depressed, sharp, as in all the genus, dilated and almost channelled at the anterior end. The color is a bluish grey, the tubercles white, and the spire reddish. In all matters of detail it is absolutely a *Littorina*. It is often spirally striated. The operculum is of four neat ovately rounded whorls, and not quite so marginal as in our other species, but still almost posterior, and at the columellar edge. The lingual ribbon lies in a coil at the back of the head. The coil is very conspicuous and round, whereas in *L. caerulea* it is not so easily seen when the animal is drawn out of its shell, as the coils are fewer, oval, and the membrane which covers it is thicker. The teeth on the ribbon are like all the genus, but it seems to me that the radula itself is broader and longer. The organs of respiration and reproduction call for no especial notice, except that they are on the typical plan of *Littorina littorea*. The muscular tissue of the body is thin and transparent, and very favorable for microscopic examination. The nervous ganglia and the neural branches are very plainly visible by transmitted light with an inch objective.

With the exception of the shell there is nothing to separate the species from the typical *Littorina*. Messrs. Adams separates it, and probably also Gray, on the ground of the tuberculations on the shell. They notice other differences, such as a callosity on the anterior lip generally, and a few-whorled operculum which has also a broad membranaceous edge. Whether these particulars apply to all the members of the genus except this one I cannot say. They do not apply to this. The operculum has four whorls, but there is no membranaceous edge, such as is very visible in our *Trochocochlea*, and there is no callosity on the lip. And I respectfully submit that if they were there they are not sufficient as generic distinctions. They are at most sub-

generic, and considering how many are absent from our species I don't think we are justified in going further than Mr. Woodward proposes, that is writing this species in future thus—*Littorina* (*Tectaria*) *pyramidalis*, Quoy.

The following *Littorinæ* (*Tectaria*) are described in Reeve and Chenu possessing tubercles on the spire. The type is *L. pagodus*, which resembles our shell in the granules being disposed in a double line on the upper part of the body whorl, and in a single line on the spire. *L. bicolor* is another very similar; *L. bullata*, Zanzibar, North Australia, and Reeve adds New Zealand, but this is an error; *L. coronaria*, Phillip Islands; *L. tectum persicum*, *L. spinulosa*, Singapore; *L. lemniscata*, Cuba, but with *L. malaccana*, Pulo-Penang, so like our *L. pyramidalis* that the identity is strongly suspected by me. *L. cumingii*, Phillip Islands; *L. dilatata*, Cuba; *L. subnodosa*, Red Sea; *L. muricata*, West Africa, Cuba; *L. vilis*, which Reeve gives as from New Zealand, but Capt. Hutton assures me there is nothing like it. It looks very much like a young specimen of our *L. pyramidalis*, and considering that Reeve misquotes Quoy, and gives New Zealand as the habitat of our shell instead of Van Dieman, we may certainly erase *L. vilis* from our lists. \* *L. feejeensis* (?) Feejee; *L. natalensis*, Natal; *L. trochoides*, hab. ? *L. granosa*, Guinea.

To sum up the results of this paper my conclusions are:—

1. That the *Littorinidæ* of Australia so closely resemble the genus *Littorina* of Europe that they cannot be generically separated from it.

2. That the genus *Risella* should be suppressed, as no permanent generic character can be defined in it, and there is only one species which is extremely variable.

3. That the species known to some authors as *Tectaria pyramidalis* is merely *Littorina*, with a double line of granules, which feature does not entitle it to generic distinction, since it shows it with many other species. If it be considered as belonging to the sub-genus, it should be remembered that it is destitute of many of the defined characters of *Tectaria*.

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\* There are many mistakes in the habitats of Reeve, which strongly dispose one to think that they arose from his regarding Van Dieman's Land as a part of New Zealand.

4. That our *Littorina mauritiana* is probably identical with the *Littorina cœrulescens* of Europe, and that *L. ziczac*, *unifasciata*, and *undulata* are merely varieties.

5. That all of our species have in the anterior aperture a groove or line, often conspicuously light in color, which is in some way connected with the organs of reproduction.

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Descriptions of five species of new Birds, from Torres Straits and New Guinea, &c.

By E. P. RAMSAY, F.L.S.

On a supposed new species of LORY, allied to LORIUS HYPÆNOCHROUS of Gray, from Cloudy Bay, South Coast, New Guinea.

*Lorius hypœnochrous* (G. R. Gray) var.

Head and nape deep black, abdomen and a broken band across the interscapular region black, with a faint violet tinge; a narrow line of crimson feathers round the back of the neck; a black band across the interscapular region, the lower portion mottled with crimson feathers; the back, rump, upper tail coverts, and the basal half of the tail feathers both above and below, the flanks, breast, chest, sides of the head and throat, and the under wing-coverts, rich crimson, the concealed parts of the breast and chest feathers becoming yellow near the base; thighs and under tail-coverts deep violet blue, the apical half of the tail feathers olive yellow below, blackish violet-blue above. Wings above green, blackish on the margins of the shoulders; the scapularus tinged with olive chiefly on their outer webs, the primaries and secondaries deep green on the outer webs, the former becoming blackish at the tips, the latter black on the tips of the inner web; all the wing quills deep bright yellow on the inner webs from near the tip to the base, the yellow covering the whole of the under surface of the wing except at the end of the primaries. Fleshy skin saving the eye purple; bare line at base of mandibles yellowish. Bill coral red, deepest at the base; legs and feet black.